

Project Title: Evaluating Strategies for Increasing Plant Diversity in Crested Wheatgrass Seedings

Project: University of Nevada Cooperative Extension, Elko, NV

Principle Investigator and Contact Information:

Kent McAdoo
University of Nevada Cooperative Extension
701 Walnut Street
Elko, NV 89801
Office Phone: (775) 738-1251
Fax: (775) 753-7843
E-mail: mcadook@unce.unr.edu

Project Description:

Objectives

Objectives of this research include:

1. Determine the effect of crested wheatgrass (*Aropyron desertorum*) control methods on wheatgrass density and cover.
2. Determine the effect of crested wheatgrass control methods and revegetation on establishment of seeded species.

Methods

Study Site

The study site, approximately 15 miles southeast of Elko, NV, is located within the 8 – 10" p.z. in sandy loam soil (Orovada Puett association) and formerly dominated by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). The area was seeded to crested wheatgrass during the 1970s. Located within the boundaries area of South Fork State Park, the site has had the necessary cultural resources clearance from the Nevada State Historic Protection Office (SHPO) and is fenced to eliminate livestock grazing.

Crested Wheatgrass Control and Revegetation Treatments

The following strategies are being tested in a randomized block, split-split plot design: (1) untreated crested wheatgrass; (2) partially controlled crested wheatgrass; and (3) completely controlled crested wheatgrass. The study site is comprised of 5 blocks.

Within the main plots in each block, the following methods of control (mechanical and chemical) and revegetated vs. non-revegetated strategies are being compared:

1. Untreated crested wheatgrass plots receiving no chemical or mechanical treatment, but divided into unseeded and seeded sub-plots.
2. Partially controlled crested wheatgrass plots split into 3-way disked or herbicide-treated plots, divided into unseeded and seeded sub-plots.

3. Completely controlled crested wheatgrass plots split into combined 3-way disked and herbicide-treated plots or combined spring and fall herbicide-treated plots, divided into unseeded and seeded sub-plots.

Treatment Implementation

During November 2007, “disked only plots” were 3-way disked. In May, 2008 “spring-applied herbicide plots” and “combined disked and herbicide plots” were sprayed with 66 oz. glyphosate/ac. In early October 2008, “combined spring- and fall-applied herbicide plots” were sprayed with 66 oz. glyphosate/ac. Sub-plots targeted for seeding were seeded at NRCS-recommended rates in late October 2008 by personnel from the NRCS Aberdeen Plant Materials Center with a Truax Rough Rider rangeland drill. For small-seed species, seed tubes were pulled so that seed fell on the soil surface; drill disks were raised, no furrows made, and a billion-type cultipacker was attached to the rear of the drill to press broadcasted seeds into the soil surface. The seed mixture used is identified in Table 1.

2009 Preliminary Results

During summer 2009, we measured cover and density of crested wheatgrass, as well as nested frequency of crested wheatgrass seedlings. We also measured density of emerging seeded species. All parameters were measured for each sub-plot within ten 0.5 m² quadrats placed randomly on each of 5 transects and perpendicular to each transect.

Complete (100%) control/mortality of crested wheatgrass was not obtained with any of the control treatments. However, spring-applied herbicide, combined spring- and fall-applied herbicide, and combined disked and herbicide treatments all significantly reduced crested wheatgrass density ($p < 0.05$) as compared to untreated areas, with no significant differences among these treatments themselves ($p > 0.05$). Similarly, these same 3 treatments all significantly reduced crested wheatgrass cover ($p < 0.01$), again with no significant differences among these treatments ($p > 0.01$). However, crested wheatgrass density was significantly greater on disked plots ($p < 0.05$) than on the untreated plots and plots receiving the other treatments, whereas cover was not significantly different ($p > 0.01$) between disked and untreated plots.

Data analysis for germination and establishment of seeded species is currently in progress, but preliminary observations show the following: (1) four of the 6 seeded native grass species established, including basin wildrye, bluebunch wheatgrass, bottlebrush squirreltail, and Indian ricegrass; (2) each of the seeded forb species, i.e., western yarrow, Lewis flax, and Munro globemallow also established; and (3) of the 2 seeded shrub species, establishment of Wyoming big sagebrush was very spotty and spiny hopsage establishment was not documented. Seeded native grasses germinated on plots both with and without crested wheatgrass control, but were much taller and more robust in plots where crested wheatgrass was suppressed. Spring growing conditions were nearly ideal, with an extremely wet June. Some grass and forb plants produced seed in this first growing season.

Table 1. Final seeding mix for South Fork study plots, Elko County, NV, in sandy loam soil (Orovada Puett association), approximately 8" precipitation zone.

Species	Kind/Variety	Seeding Rate (PLS lb/acre)	Total No. lb (for 12.5 acres)
Indian ricegrass ¹ (<i>Achnatherum hymenoides</i>)	'Nezpar'	2.0	25
Bottlebrush squirreltail ¹ (<i>Elymus elymoides</i>)	Toe Jam Creek	2.0	25
Needle-and-thread grass ² (<i>Stipa comata</i>)		2.0	25
Basin wildrye ³ (<i>Elymus cinereus</i>)	'Magnar'	2.0	25
Bluebunch wheatgrass ³ (<i>Psuedoroegneria spicata</i>)	'Secar'	1.0	12.5
Sandberg bluegrass ⁴ (<i>Poa secunda</i>)		0.75	9.4
Munro globemallow ⁴ (<i>Sphaeralcea munroana</i>)		0.50	6.25
Lewis flax ³ (<i>Linum lewisii</i>)	'Appar'	0.75	9.4
Western yarrow ⁴ (<i>Achillea millefolium</i>)		0.20	2.5
Wyoming big sagebrush ³ (<i>Artemisia tridentata</i> <i>wyomingensis</i>)		0.20	2.5
Spiny hopsage ⁵ (<i>Grayia spinosa</i>)		0.50	6.25
Totals		11.9	148.8

¹ From Granite Seed Co.

² From BFI Native Seeds

³ From Comstock Seed Co.

⁴ From FS Collection

⁵ From Native Seed Co.

Future Plans

Sampling

Beginning in summer 2010, we will continue to collect cover and density data, as described above for seeded species. We will also establish additional plots in 2010 for comparisons between years.

Analysis

Data will be analyzed using mixed model analysis, with blocks and years considered random and other treatments considered fixed.

Publications:

Interim results will be presented at scientific meetings and during field tours for scientists, agency resource specialists, agricultural producers, and other interest groups. Final results will be published in refereed journals.

Presentations:

McAdoo, K., J. Swanson, C. Poulsen, B. Schultz, and N. Shaw. February 2010.

Evaluating strategies for increasing plant diversity in crested wheatgrass seedings. Joint Meeting, *Society for Range Management* and *Weed Science Society of America*. Denver, Co. (**Abstract accepted**).

Management Applications:

The relative success and/or failure of revegetation strategies and methodologies used in this research will be communicated in appropriate venues for the benefit of both public and private land managers and resource users. This research will add to the body of knowledge regarding the rehabilitation, functionality, and restoration of Great Basin rangelands.

Products:

We will conduct a field tour on August 17, 2010 to look at results of applying crested wheatgrass reduction methodologies and seeding native species.